

# Unit 2: Atomic Structure

## Atomic Theory

The concept that the world was made up of atoms is given credit to a person by the name of Democritus (about 400 B.C.). He stated that atoms only differed in size and shape. He had no scientific proof that atoms existed or what held them together so his theory was discarded.

In the early 1800s a man named Dalton came up with the accepted “modern” theory about the existence of atoms.

Dalton’s Atomic Theory (about 1820):

1. All matter is made up of small particles called \_\_\_\_\_
2. All atoms of the same element are \_\_\_\_\_ \*\*\*later change due to isotopes
3. Atoms can not be \_\_\_\_\_ \*\*\*later changed due to nuclear changes
4. Atoms of different elements are different
5. Atoms unite in definite ratios to form \_\_\_\_\_
6. Law of Conservation of Mass
7. Chemical reactions involve the rearrangement of the atoms, the atoms are \_\_\_\_\_ in a chemical reaction

\*\*\*Atoms at this time were thought to be completely solid and not made up of smaller particles.

Research on Sub-atomic Particles:

J.J. Thomson (1897):

Discovered the \_\_\_\_\_ while working with a cathode ray tube (like an old TV screen)

\*\*\*cathode rays are actually electrons

Millikan (1909):

Discovered the \_\_\_\_\_ of an electron.

Goldstein:

Discovered the \_\_\_\_\_ a few years after discovery of electron.

Thomson (again):

Discovered the \_\_\_\_\_ of a proton.

Note: mass of proton =  $1.67 \times 10^{-24}$ , mass of electron =  $9.11 \times 10^{-28}$

The mass of a proton is about 2000 times greater than the electron.

Thomson's model of the atom after discovery of electron and proton:

- Because the atom is electrically \_\_\_\_\_ the atom must have the same number of protons and electrons.
- The electrons and protons were thought to be \_\_\_\_\_ about in the atom and the atoms was thought to be completely solid.

\*\*\*The rest of the mass of the atom is due to \_\_\_\_\_.  
Scientists knew that there was more to the atom than just protons and electrons...

Chadwick (1932):

Discovered the \_\_\_\_\_.

\*\*\*Neutrons have the \_\_\_\_\_ as protons.

## Rutherford Experiment (about 1910):

Experiment design- shot alpha particles at a thin sheet of gold foil.

Alpha particles: +2 charge

Results:

- 1) most of the alpha particles went straight thru
- 2) some were deflected to the side
- 3) a few bounced back

Explanation of results:

- 1) The atom is mostly empty space
- 2) The atom has a small center of mass (the nucleus)
- 3) The center of mass must have a positive charge
- 4) The electrons must be outside the center of mass

